

ART. JV.—*Cases of Opium Poisoning treated by Belladonna, with Remarks.* By WILLIAM F. NORRIS, M. D., Resident Physician to the Pennsylvania Hospital.

CASE I. —, aet. 19, druggist, was admitted into the Pennsylvania Hospital Feb. 21st, 1862. On the morning of the 21st he came to the shop of his employer as usual, where he remained till after 10 o'clock, when he went to Rosengarten & Son's chemical works, and there purchased an ounce of the sulphate of morphia. He then walked into the outskirts of the city where he obtained some water, poured it into the bottle containing the morphia, and after having swallowed a large mouthful, recorked the bottle and put it into his pocket. This bottle was subsequently obtained by his employer, who carefully evaporated the contents to dryness, and found seventy-five grains missing from the ounce. The patient insisted that none of the contents of the bottle had been spilled. He afterwards wandered about the town for an hour and a half, when he began to feel tired and sleepy, and being near a friend's house, went in, stating that he had poisoned himself, and that he wished an interview with his sister before he died. He now appears to have become frightened at the step he had taken, and a few minutes after, although he was very sleepy, and his gait staggering, walked to a neighbouring drug store, and obtained and swallowed two drachms of tannic acid, with a view of counteracting the effects of the morphia. His friends being much frightened, at once sent for his employer, who soon arrived and administered a quantity of sulphate of zinc. Dr. W. F. Atlee, a short time after, repeated the dose which then caused free emesis. He also gave a strong decoction of coffee with two grain doses of Squire's extract of belladonna, in solution, which were repeated at short intervals, until in about an hour he had taken twenty grains of the extract. When admitted into the hospital at 2.15 P. M. his pupils were contracted to a pin's point, his pulse 80 and soft, his gait staggering; slow of speech, although if sharply questioned, he would answer his name. He complained of thirst, and would sleep even when standing up if those supporting him did not keep him constantly in motion. He was at once sent into the garden, where two attendants kept him walking briskly. Ten grains of Herring's extract of belladonna in solution were then administered, and this was repeated in half an hour (3 o'clock). The pulse had now risen to 100, but the pupils were still excessively contracted, his intellect was, however, more active, and he now gave a tolerably clear account of himself, complaining of thirst. At 3.30 the pupils were beginning to dilate, though he continued still very drowsy. At 3.45 his condition remaining unchanged, the pupils continuing about the same size, and no flush of the face being perceptible, ten grains more of the extract of belladonna in so-

lution were given, making in all fifty grains, thirty of which were given after his entrance into the hospital. At 4.5 there was a marked change for the worse; he could no longer support his own weight, and the attendants who had charge of him dragged him along; his pulse was 120, and his pupils widely dilated. He was now carried up stairs, stripped and put under a cold shower bath, which revived him so much that he struggled strongly to get away; he was rubbed briskly with coarse towels till dry and the skin red. The good effects of the bath were but transient, for even before he was thoroughly dried, drowsiness again overtook him, and vigorous shakings with repeated attempts to make him walk entirely failed. He was therefore placed in bed. His respiration was laboured and very slow. At this period Dr. F. G. Smith, the attending physician, saw him, and directed the application of the galvanic battery, one pole being placed over the cervical vertebrae, and the other over the diaphragm. It was then attempted to cause him to swallow some brandy with two grains of sulphate of quinia in solution, but this failed, a portion running into the larynx and exciting cough. Half an ounce of brandy was then given by injection, and at the same time mustard plasters were applied to the abdomen and inside of the thighs. Under the action of the battery the frequency of the respiration was much increased.

At 5.30 the pupils were fully dilated, respiration 11 per minute, pulse 112, capillary circulation more active, and a slight red flush of the face showed the full action of the belladonna. The injection of brandy was repeated at 6.30 and 7.30, but there was no material change in the symptoms. At 8.30 the pulse was found to be more feeble, the lips bluish, and respiration more laboured. The temperature of the surface was not much reduced. The galvanic battery was now reapplied, and under its influence the number of respirations rose to 13 per minute; this was followed by an injection of brandy, and sulphate of quinia. At 9.45 the injection was repeated; he then opened his eyes and looked around, but would not answer when spoken to, and soon relapsed into his comatose condition. His pupils continued dilated, and did not contract under the influence of light. Respirations were 12 to the minute and not quite so stertorous. Pulse 114 and stronger, the skin was warm and the flush had disappeared from the face. The mustard plasters having acted well had been transferred to the back and chest, where, having thoroughly reddened the skin, they were now removed. At 11.30 the skin was warm, lips red, pupils still dilated, and immovable, breathing stertorous, 10 per minute. The battery was again reapplied and the number of respirations increased to 12, pulse 108. He roused up and made some resistance during the application of the battery, mumbling, "What are you about?" but at once on cessation of the current dropped off into stertorous slumber. At 1 o'clock A. M. he had so far recovered that the nurse was unable to give him his injection on account of his violent resistance; he refused to take anything unless he could see the

Doctor's prescription for it. At 2 he was able to talk, and promised to swallow the medicine which was directed for him. The nurse reports his having vomited a dark-coloured liquid during the last hour, his pupils are still dilated and immovable, pulse 114, respiration 12 per minute. Half an ounce of brandy was now given him by the mouth, and a wine-glass of milk punch was ordered for him at 3 and 5. His respiration continued stertorous. At 8 o'clock he was awake and rational, his pupils somewhat dilated, pulse 114, full and strong, respirations 16 to the minute, easy and natural. At 9.30 his condition was much the same, his bowels, however, had been moved, the evacuation being normal in character. He has also had much bilious vomiting, to relieve which, he took lime-water and milk. At dinner time he took some beef essence, which he retained, and has had no vomiting since. His skin was still considerably reddened from the application of the mustard. From this period he continued steadily to improve, and on the next day had regained his usual health and appetite.

CASE II. J—K—, wt. 55, was admitted into the Pennsylvania Hospital on the 24th of March, 1862. He had two small superficial wounds in the neck, and a larger one at the bend of the left elbow, exposing, but not wounding, the median cephalic and basilic veins. He was brought into the house about 5 o'clock P. M., surly, and rather soporose, with a weak pulse. It was stated that his wounds were the result of an attempt at suicide at his place of business early in the morning, and that not succeeding in this, he had at about 9 o'clock swallowed the contents of an ounce phial of laudanum. An emetic was at once administered to him, consisting of thirty grains of sulphate of zinc with an ounce of the wine of ipecacuanha, followed by a small quantity of warm water. In about three-quarters of an hour this produced slight vomiting. At 6 o'clock five grains of the extract of belladonna in solution were administered. This was repeated at 7 o'clock, at which period no change was remarked in his condition, except that he had become more sleepy, and could be kept awake only by having an attendant constantly to shake and talk to him. An hour later (8 o'clock) he had become still more sleepy, and the dose of belladonna (five grains) was repeated, but it was with great difficulty that he could be made to swallow it; he would put it to his lips, and before he had swallowed more than a few drops, would again fall asleep. At half past 8, his attendants were unable to keep him awake. At 9, his pulse was very feeble and rapid, his breathing stertorous, his pupils—as had been the case from the time of his admission—contracted, but not to a pin's point. Two grains and a half more of the extract of belladonna were now administered, large mustard plasters were applied to the front of the chest, and he was subjected to a strong current of electricity from an electro-magnetic battery, one pole being placed over the diaphragm, the other on the cervical vertebrae. His pupils had now become dilated, showing the full action of the belladonna. Notwithstanding

these remedies, his respiration grew slower; at 10, the pulse at the wrist could not be felt (auscultation over the heart, however, showed it to be 120). A little later, even under the stimulus of the battery, his respirations were only seven per minute. Artificial respiration was now employed, causing expiration by pressure on the anterior part of the thorax, and allowing inspiration to take place through the natural resiliency of the parts. Small doses of whiskey, frequently repeated, were administered. It was with great difficulty, however, that he could be made to swallow it. Under this treatment he slowly improved; at 2 o'clock A. M. his pulse was 120, and could easily be felt at the wrist; respiration still stertorous, sixteen to the minute. At 4, 8, and 9 o'clock no change was noted, except that his pupils were less dilated than they had been the night before. At the latter hour, milk-punch every half hour, with 20 m. spts. ammoniae aromat. was ordered. His condition remained much the same up to 12 o'clock, when he suddenly sank, and a few minutes after expired. No post-mortem examination could be obtained.<sup>1</sup>

The first of the preceding cases presents several points of interest. 1st. The length of time which intervened between the taking of so large a quantity of morphia, and the appearance of the symptoms, which mark the second or soporose stage of the action of that drug. 2d. The recovery of the patient after taking so large a quantity of the poison. 3d. The action of the belladonna.

I. *The length of time which intervened between the taking of the large dose, and the appearance of the symptoms.*—In regard to the first point, Mr. Taylor, in his work on *Poisons*, remarks: "When any one of the salts of morphia is taken at once in an overdose, the symptoms are strongly marked, and they follow each other more speedily. They generally commence in from five to twenty minutes after the poison has been swallowed."<sup>2</sup> Although this be the rule, yet the volume of the same author furnishes a remarkable exception to it, for at page 547, he relates the case of M. Bonjean, who swallowed fifty-five grains of the acetate of morphia, dissolved in an ounce of water, in whom "no symptoms of any importance manifested themselves until an hour after the poison was taken, and then there was simply giddiness, with a tendency to sleep. Two hours after the occurrence, he had still the power to answer questions! In four hours, deep coma supervened."

Christison quotes a case from *Orsila* where twenty-two grains of the muriate of morphia were taken, in which four hours elapsed before the patient first felt approaching stupor.<sup>3</sup> Half an hour later he could still answer questions, although he could not see the interrogator. This de-

<sup>1</sup> I am indebted to my colleague, Dr. John Ashurst, for the notes of this case.

<sup>2</sup> Taylor on Poisons, Philadelphia, 1859, p. 544.

<sup>3</sup> Christison on Poisons, Philadelphia, 1845, p. 558.

layed action is seen in other preparations of opium, and the same author relates the case of an habitual drunkard, who swallowed two fluidounces of laudanum, "while intoxicated to excitement from beer and spirits," where no material stupor appeared for five hours. He also adduces a case taken from Corvisart's Journal, where two and a half fluidounces of laudanum, with one drachm of extract of opium (*i. e.*, 213½ grs. of opium) were taken, without producing well-marked stupor till after the lapse of more than an hour.

II. *The recovery of the patient after so large a dose.*—The largest recorded dose of any of the salts of morphia from which any patient has recovered, that I have been able to find, is the case of M. Bonjean (above quoted) who took fifty-five grains of the acetate of morphia in solution. Taylor also gives a case where fifty grains of the same salt were taken on an empty stomach, and another where twenty grains were swallowed, both of which recovered. Christison (pp. 558–559) mentions an example of recovery from twenty-two grains of the muriate of the same alkaloid.

III. *The action of the belladonna.*—Belladonna, under the different names of *στρυχός μαρικός*, solanum furiosum and belladonna, has been described by both ancient, mediæval, and modern writers. As it is an ornamental plant, growing in temperate climates, and having berries which possess a sweetish taste, there have been many cases of poisoning by it reported, principally from the accidental eating of the berries; and the symptoms of poisoning from its use seem to have been almost as familiar to the old authors as to us of the present day. A knowledge of the antagonistic powers of opium and belladonna seems also to be of early date. Pena and De Lobel, in their work entitled *Stirpium Adversaria Nova*,<sup>1</sup> so early as 1570, give an account of Italian peddlers who excited the wonder of the common people by giving, to alleviate thirst, portions of the root of the belladonna, the evil effects of which were averted either by vinegar, wine, or theriaca.<sup>2</sup> In 1661, Horstius, in his *Opera Medica*,<sup>3</sup> relates the case of a man who swallowed a spoonful (*cochleare plenum*) of the inspissated juice of the belladonna, by mistake for rhubarb, sambuci. This was followed by dimness of vision, dryness of the throat, delirium, and tremors, from which he is stated to have recovered, after taking

<sup>1</sup> *Stirpium Adversaria Nova*, authoribus PETRO PENA, et MATHIA DE LOBEL, Medicis. Londini, 1570, p. 103.

<sup>2</sup> Theriaca was frequently administered by the old authors as a specific in all cases of poisoning; thus Prosper Alpinus remarks: "Omnes affirmant theriacam illam (viz., Egyptiorum), vim efficacissimam habere adversus omnia venena."—Prosper Alpinus, *De Medicina Egyptiorum*, lib. iv. p. 308. Lugdini, Batavorum, 1718. Giacomini also quotes him as stating that opium, combined with belladonna, weakens the action of the latter.

<sup>3</sup> *Opera Medica*, tom. ii., lib. 10, p. 515. Gouda, 1661.

theriaca, with the juice of rue. In the work of Faber on *Strychnomania*,<sup>1</sup> published in 1677, thirteen cases in which belladonna berries were swallowed, are recorded; of these, two escaped without any unpleasant symptoms, but the remaining eleven were affected with delirium, dimness of vision, difficulty of swallowing, and a number with redness of the skin. Out of this number, there were two deaths; in both the delirium passed away, and coma preceded death. The treatment in ten of these cases consisted chiefly of theriaca, with adjuvants, which varied more or less in each case.<sup>2</sup> He also quotes a case from Brotbequius, a contemporary, of a similar kind, in which recovery took place after the exhibition of opium.<sup>3</sup> In 1766, M. Boucher, of Lille,<sup>4</sup> published five cases of poisoning by belladonna berries; his treatment consisted chiefly in the administration of emetics, purgatives, enemata, and vinegar; the latter he looked upon as an antidote to belladonna. In two cases, however, one of which was in a state of coma, and the other delirious, preparations of opium were administered. I have not been able to find any further reference to the subject until 1810, when Joseph Lipp published an inaugural dissertation, entitled "*De beneficio baccis belladonnae producto atque opii in eo usu.*" This paper I have been unable to consult, but Giacomini,<sup>5</sup> in his *Traité de Matière Médicale et de Thérapeutique*, states that in it are recorded several cures by means of Sydenham's laudanum. The latter author, in his article on opium remarks that it has constantly been found useful in the treatment of poisoning by hyoscyamus, stramonium, and belladonna, and asserts "*Les Italiens ont donné dans ces cas l'opium à haute dose et ils ont vu la stupeur, le délire et les convulsions disparaître.*"<sup>6</sup> In a paper read before the Physiological Society of Edinburgh, by Dr. Thomas Anderson, in 1854, he remarks that, following out the suggestion of Dr. Graves, that an agent which would dilate the pupils might be administered with advantage in cases of coma with contracted pupils, in low fevers, it occurred to him to use belladonna in opium poisoning, and he there details two cases successfully treated by it.

From this period up to the present time, there have been numerous cases reported in the journals, both of opium poisoning, treated by belladonna, and belladonna poisoning, treated by opium. Of such of these as I have been able to collect details, I subjoin the following tabular list.

<sup>1</sup> *Strychnomania explicans strychni manici antiquorum vel solani furiosi recentiorum historiæ monumentum, indolis nocumentum, antidoti documentum, etc.,* by Johannes Matth. Faber, August. M. D. Augustæ Vindelicorum, 1677.

<sup>2</sup> *Ibid.*, pp. 4-18.

<sup>3</sup> *Ibid.*, pp. 25 and 26.

<sup>4</sup> *Journal de Médecine, Chirurgie et Pharmacie, etc., tom. xxiv. Janvier, 1776, pp. 310-332.*

<sup>5</sup> Giacomini, *Traité de Matière Médicale et de Thérapeutique*, Paris, 1839, p. 537, published in the *Encyclopédie des Sciences Médicales*.

<sup>6</sup> *Ibid.*, p. 70.

*Cases of Opium Poisoning treated by Belladonna.*

Amount of opium.	State of patient.	Age.	Amount of belladonna administered.	Results.	Authority.
Sol. morph. muriatis f3ij (Ed.) (about 9 grains) in 36 hours.	The patient previously labouring under delirium tremens, now fell into profound coma, breathing 4-5 per minute, stertorous; pupils contracted to mere points; the pulse excessively weak and slow.	Not g'n.	Tinct. belladonna f5vj; a dose of a fluidrachm, repeated every half hour.	Recovered from the effects of opium but died 3 days afterwards from exhaustion on sudden rising. Coma had disappeared in 4½ hrs. after the first dose of belladonna.	Anderson, Edin. Journ. Med. Sci., 1854, p. 377-378.
Tinct. opii f3v. (Ed.) about 23 4-10th grs. of opium, in an hour and a half. Tinct. opii f3j, i. e. 37½ grains of opium.	Entirely comatose; pupils contracted to mere points; respiration stertorous, 10 per minute; the pulse feeble and extremities rather cold.	50	Tinct. belladonna f3j-f5ij; in the course of an hour.	In 5 hours, "all indications of opium poisoning had disappeared."	Loc. cit.
Tinct. opii f3ij, i. e., 75 grains of opium.	Comatose; respiration stertorous; pulse feeble, and 50 per minute; surface cold and pupils contracted to a mere speck.	24	Extr. belladonna gr. viij. Tr. do. f3j.	Complete recovery.	Mussey. Bost. Med. & Surg. Journ. vol. IIV., 1856, p. 56, from Cincinnati Med. Obs.
Unknown.	Profound coma; skin pale, cold, clammy; pulse feeble, 40 per minute; respiration slow and "laborious; pupils excessively contracted."	2	Tinct. belladonna f5vj; a dose of 15vj repeated every 20 minutes.	Perfect recovery in 2 hours.	Lee, Amer. Journ. Med. Sci., Jan., 1862, p. 57-58.
Tinct. opii f3xss, about 36½ grs. of opium.	Deeply comatose; pupils contracted "to a pin's head size."	Not g'n.	Tinct. belladonna f3xjss; in less than three hours.	Rapid and perfect recovery.	Motherwell, Med. Times and Gazette, Jan. 4, 1862, from Australian Med. Journ. Oct., 1861.
Sydenham's laudanum (quantity unknown.)	Somnolence followed by vomiting, which was very distressing.	40	Hydro-alcoholic extract of belladonna two centigrammes (about 3-10ths of a grain.)	The vomiting was promptly checked, and all traces of poisoning disappeared.	Béhier, Ann. de Thérapeutique, 1860, pp. 18-19, par A. Bouchardat.
Decoction containing two poppy heads.	Constant somnolence; malaise; nausea; vomiting; face pale; pulse small; skin cool; pupils contracted.	54	One centigramme of the hydro-alcoholic extract of belladonna (about 16-100th gr.)	Cure.	Béhier, Loc. cit. p. 19-21.
Tinct. opii f3ij (i. e. 75 grains of opium).	An hour and a half after taking the opium, she had a flushed face; pulse 70; contracted pupils; stertorous breathing; could be roused with great difficulty; was given an emetic which brought up dark liquid smelling of laudanum; 5 hours after taking laudanum was insensible to external impressions; pupils excessively contracted; surface cold and clammy; unable to swallow; countenance pale; pulse thready and feeble, almost imperceptible.	38	Tinct. belladonna f3j (by the mouth); Extr. belladonna gr. xx, in solution, by the rectum within 17½ hrs.	In 27½ hours after taking the laudanum she had entirely recovered.	Duncan, Am. Journ. Med. Sci., July, 1862, p. 277-8.

Amount of opium.	State of patient.	Age.	Amount of belladonna administered.	Results.	Authority.
Tinct. opii fʒ (i.e. 4% grains of opium.)	Not capable of being roused; breathing heavily; pupils contracted to a point; skin warm; pulse 100, small; incapable of swallowing. (The child was convalescing from an attack of pneumonia following measles.)	4	15 drops of Thayer's fluid extract of belladonna, in dose of 2 to 3 drops, by the rectum.	Died in about 13 hrs. after taking the laudanum; asphyxiated from the collection of mucus in the bronchial tubes. The child had exhibited marked improvement after each dose of belladonna, and shortly before death all symptoms of opium poisoning "were entirely relieved."	Blake, Am. Journ. Med. Sci., July, 1862, p. 280-281, from Pacific Med. and Surg. Journ., Apr. 1862.

*Cases of Belladonna Poisoning treated by Opium.*

Amount of Belladonna.	State of Patient.	Age.	Interval since taking Belladonna.	Emesis.	Amount of Opium taken.	Result.	Authority.
10 berries.	Dryness of throat, dimness of sight, followed by delirium.	23	7 hours to the first dose of opium.	3 hours after taking berries.	Tinct. opii ⅞xxv, dose ⅛v at first every 4, then every 2 hours (i.e. nearly 3 grains of opium).	Cured.	Seaton, Medical Times and Gaz. vol. xix. p. 551-2. Loc. cit.
8 berries.	Dryness of throat and tongue, followed by delirium.	25	22 hours to first dose of opium.	4 hours after.	Tinct. opii, ⅞xxv, (nearly 2½ grs.), in dose of ⅛x.	Cured.	Loc. cit.
6 berries.	Dryness of throat, etc., intensely delirious.	7	10½ hr's. to first dose of opium.	6½ hours after.	Tinct. opii, ⅞xxlv, in dose at first of ⅛vij, every hour, afterwards the dose was doubled as morphia. Whole quantity taken in 15½ hours, a little more than 9 ⅛ per hour.	Cured.	Loc. cit.
2 berries.	Delirious, with the other symptoms of poisoning.	14	11 h'rs.	..	Tinct. opii, ⅞xxlv, about 11 grs. of opium in 12 hours.	Cured.	Loc. cit.
12 berries.	Symptoms commenced in an hour, became delirious in 3½ hrs.	46		From a dose of castor oil.	Tinct. opii, ⅛vij, and afterwards ⅛vij, every hour till sleep was obtained.	Cured.	Loc. cit.
5 berries.	Delirium, etc.	8	12 h'rs.	..	Tinct. opii, ⅛clxviii, about 13 grs. of opium in 17 hours.	Cured.	Loc. cit.
2 berries.	Delirium, etc.	12	10 h'rs.	None.	Tinct. opii, and morphia the equivalent of 24 grains of opium in 38 hours.	Cured.	Loc. cit.
Number of berries unknown.	Delirium, etc.	14	12 h'rs.	8 hours after taking berries.	Tinct. opii, ⅛lxxvj, 6 grains of opium in 9 hours, dose ⅛viii, at first, increased to ⅛xiij.	Died 29 hrs. after taking berries; comatose, and pupils widely dilated; in all cases which recovered the pupils contracted before they slept.	Loc. cit.

Amount of Belladonna.	State of patient.	Age.	Interval since taking belladonna.	Emesis.	Amount of opium taken.	Result.	Autho- rity.
4 berries.	Pupils dilated, thirsty, skin hot, pulse 110, these symptoms which appeared in 2½ hours, followed by violent delirium.	9	5 hours till delirium set in, 15 hours to 1st dose of morphia.	..	10 " solution of muriate of morphia (L.) (with fʒj of brandy) 15 hours after eating berries, then fell asleep, during sleep a scarlet rash appeared, woke the next morning delirious and was given the 1d of a grain of morphia in divided doses, but did not sleep till evening; woke well.	Cured.	J. Todd, British Medical Journal, Sept. 21, 1861, p. 305.
Succus. belladonna fʒj.	Pupils dilated, tongue dry, pulse slow and bounding, purple flush of the face, almost comatose.	6	..	None.	Tinct. opii, gtt. 120.	Cured.	Lee, Am. Journal Med. Sci., Jan., 1862, p. 57.
A cup of the infusion of the leaves of belladonna.	Symptoms analogous to those of delirium tremens.	..	..	..	3 centigrammes (nearly half a gr.) of the gummy extract of opium from hour to hour.	Cured.	Cazin, Traité prat. des Plantes Médicin. Paris, 1858, p. 123.
Belladonna plaster on the knee; the cuticle having been previously removed by a blister.	In less than an hour bright erythema of the face, breast, and thighs, with intolerable itching, giddiness, nausea, dilatation of the pupils, constriction of the fauces, and thirst.	Ad't	Less than an hour.	..	Tinct. opii, fʒj, aq. cinnamoni fʒj, afterwards Tr. opii ʒxv. "The first dose antagonized the belladonna in less than 30 minutes after it was taken."	Cured.	Lopez, N. Am. Medical Chir. Review, March, 1860, p. 285.
Belladonna plaster four by two on epigastrium.	Headache, giddiness, nausea without vomiting, dryness of throat, delirium.	..	25 hours to the 1st dose of opium.	..	Laudan. Liq. Syd. gtt. xv, with extr. opii gr. ¼ in solution every five minutes; after the first four doses the delirium began to yield, dose repeated now every half hour only. "On the following morning the patient was in a perfectly satisfactory state, and despite the rather large quantity of opium taken, no sign whatever of narcotism was observable, an unanswerable proof of the antagonism of these two medicines."	Cured.	Perroud, Rank- ing's Ab- stract, vol. 33, 1861, p. 280.
Suppository containing one grammme (i.e. 15.43 grains) of asafoetida, extr. belladonna one centigramme (i.e. 0.15 gr.) one had been administered every day for six days, when symptoms of poisoning appeared.	Dryness of tongue, face flushed, eyes injected, pupils dilated, mind a little excited.	..	..	..	15 grammes of "sirop diacode" caused subsidence of all the symptoms in 25 minutes. The same quantity was given in the evening with two cups of coffee.	Cured.	Béhier, Ann. de Thérapeutique, p. 22-24, 1860, par A. Boucharadat.

*Cases of Poisoning by Atropia treated by Opium.*

Amount of atropia injected.	State of patient.	Age.	Amount of opium or its preparations administered.	Result.	Authority.
Sulphate of atropia, gr. $\frac{1}{4}$ , injected over the sciatic nerve.	Face flushed, breathing hurried, pulse rapid and small, skin hot and perspiring, restless, hands moving as if engaged in his ordinary work, inability to speak from dryness of the mouth, itching of the skin, both cornea were disorganized (previously), and therefore pupils not visible.	..	Morphia muriatis solut. "XXXV. (double ordinary strength of the Edinburgh Pharmacopoeia) i. e. about $\frac{1}{2}$ gr. of the muriate of morphia, were injected into the gluteal region of the opposite limb.	Almost immediately became calmer, slept in an hour; next day was quite well.	B. Bell. Edin. Med. Journ., vol. iv., July, 1855, p. 5-6.
Sulphate of atropia, gr. 1-12th.	Dryness of throat, pulse rapid and rather small, slight delirium, subsultus, and jerking of the hands.	..	Morphia muriatis solut. "XXXV. (same strength as above) i. e. about $\frac{1}{2}$ of a grain.	Relief immediate.	Ibid. p. 6-7.
Sulphate of atropia, gr. 1-30th.	Face intensely red, eyes brilliant, irides dilated, mouth and throat dry, difficulty of swallowing, nausea.	..	" $\frac{1}{2}$ grain doses of morphia were given in quick succession, and in another hour the man was out of bed and well, except the mydriasis which remained until the following day."	Cured.	Lee.
Sulphate of atropia, gr. 1-30th.	Toxic effects in half an hour, face and eyes injected, pupils dilated, giddiness and staggering gait, gastric pains but no vomiting.	..	" $\frac{1}{2}$ grain doses of morphia 'promptly allayed the symptoms.'	Cured.	Lee. <sup>1</sup>

In addition to the cases detailed in the foregoing table I have met with several others which, however, have not been reported with sufficient accuracy to admit of being tabulated. Thus, M. Béhier gives seven cases of poisoning resulting from subcutaneous injections of the sulphate of atropia; he records one of these at some length, and sums up his remarks as regards treatment thus: "In him, as in six other cases, opium in form either of extract or syrup arrested all the toxic phenomena." (*Ann. de Thérapeutique*, 1860, p. 38.)

M. COURTY, also, treating of the use of the same alkaloid in hypodermic injections, remarks: "Nevertheless, in the small number of cases where the atropic intoxication has given origin to cerebral symptoms which have appeared to require treatment, opium in doses of 25 milligrammes (i. e. 0.28 grain) every half hour hastened the return of the functions to their normal state, by neutralizing in a manner the effects of belladonna upon the brain. One to two pills has ordinarily sufficed for a cure." (*Ann. de Thérapeutique*, par A. Bouchardat, 1860, p. 40.)

In addition to the cases referred to in the foregoing table, where opium and belladonna have been given with a belief in their antidotal powers, several interesting observations are recorded where these agents in large quantity have been administered simultaneously through accident. Christison relates the case of a lady poisoned by three successive injections into

<sup>1</sup> I am indebted to my colleague, Dr. C. C. Lee, for the details of these cases. He refers to them in his paper on Opium and the Mydriatics.—*Amer. Journ. Med. Sci.*, Jan. 1862, p. 59.

the vagina, each containing "the active matter of a scruple of opium and half an ounce of belladonna leaves." Three hours afterwards she was insensible and motionless, the face pale, pupils dilated, pulse frequent and small, and the breathing hurried. He remarks: "Here the opium seems to have prevented the delirium usually induced by belladonna in the early stage, while on the other hand the belladonna prevented the usual effect of opium upon the pupils, and actually produced the opposite action."<sup>1</sup> The patient entirely recovered. Cazin gives an instance where six grammes of Sydenham's laudanum with two grammes of tinct. belladonnæ (equivalent to vini opii fʒj, m<sub>l</sub> xlvi; tr. belladonnæ fʒj, U. S. P.) with forty grammes of the oil of sweet almonds, intended as a liniment, were by mistake swallowed. This large dose caused only somnolence, injection of the face and conjunctiva, and dilatation of the pupils.<sup>2</sup> Dr. Coale reports a case where a child aged nine years swallowed two suppositories containing four grains of extract of belladonna and four grains of opium with very slight effect. The reporter, however, "supposes it possible" in this case that as dinner had been eaten a short time before, this may have retarded absorption.<sup>3</sup> Newman records a case where minute portions of a belladonna plaster accidentally swallowed immediately dispelled the soporific effects of a previous dose of morphia and caused some of the symptoms of belladonna poisoning.<sup>4</sup>

The foregoing cases seem conclusively to show that in opium poisoning, belladonna in doses which in a state of health would certainly poison, may be administered with impunity and be followed by a rapid subsidence of the symptoms produced by the exhibition of the former drug, and vice versa that opium rapidly and safely counteracts the poisonous influence of belladonna. The treatment above indicated has, indeed, in some cases failed, and this may prove that they are not mutually specifics; but even in these fatal cases (which are few) we may sometimes see a partial amelioration of the symptoms, and it is well worthy of inquiry how much in these instances the relative quantities of the two drugs administered, the stage of poisoning in which the patient was first seen, the age and constitution may have contributed to the result.

Finally, how do they counteract each other? The mode of action of these drugs on the nervous system is not at present well understood, although several able essays have been written upon it. To those interested in the toxicology of these prominent narcotics I would especially refer as well worthy of perusal the papers of Mr. Hughes *On the Significance of the Contraction and Dilatation of the Pupil produced by Opium and Belladonna*.

<sup>1</sup> Christison on Poisons. Philada., 1845, p. 742.

<sup>2</sup> Cazin, Plantes Médicinales Indigènes. Paris, 1858, p. 149.

<sup>3</sup> Coale, Amer. Journ. Med. Sci., vol. xxvi. 1853, p. 69.

<sup>4</sup> British Med. Journ., July 13, 1861, p. 30.

*donna respectively;*<sup>1</sup> Mr. Harley *On the Physiological action of Atropine in Dilating the Pupil;*<sup>2</sup> of Fuller *On the Administration of Belladonna, and on certain Causes which modify its action;*<sup>3</sup> and of Lee *On Opium and the Mydriatics.*<sup>4</sup>

The further investigation of these subjects offers an attractive field for future observers as well as to experimental physiologists. The object of this paper will have been fully attained if it succeeds in drawing more attention to the subject by exhibiting the mass of evidence which has already accumulated to sanction a belief in the mutual antagonism between opium and belladonna.

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**ART. V.—*On Fracture of the Sternum.*** By JOHN ASHHURST, JR., M.D., late Senior Resident Surgeon to Pennsylvania Hospital.

PATRICK G—, a labouring man aged thirty-seven years, was admitted into my ward in the Pennsylvania Hospital on the 26th of December, 1861, with the following curious complication of injuries: His sternum was fairly broken across a little below the junction of the manubrium and gladiolus; his left clavicle was broken very obliquely at the outer third, and the sternal end luxated from its attachments, and riding down over the first rib and broken sternum; in addition to these injuries his left radius was obliquely fractured in its lower third.

The accident had happened in this way: the man was riding in front of one of the small hand-cars used by workmen upon railways, and by a sudden jolt had been thrown forwards between the wheels and beneath the axle of the car, which passing over him crushed his breast against the ground.

The shock at the time of admission was considerable; the dyspnoea very great, and accompanied by constant coughing and spitting of blood. Great anxiety and a firm expectation of death tended to complicate what under the most favourable circumstances would have been a case of very doubtful prognosis.

The displacement of the sternum was inwards, so as to press upon and probably wound the lung, the upper fragment being depressed; the fractured clavicle allowed the shoulder to fall very much forward; while the deformity in the radius was eminently characteristic.

The various injuries were dressed in the following manner: Compresses were placed over both portions of the sternum (so as to relieve the angular inward displacement), over the luxated sternal end of the clavicle and over the seat of fracture in the same bone, and were secured in their places by broad strips of adhesive plaster, and a bandage as firmly applied as could

<sup>1</sup> London Med. Rev., August, 1860.

<sup>2</sup> Edin. Med. Journ., vol. ii. part 1, 1857, pp. 431–435.

<sup>3</sup> Proc. Royal Med. and Chir. Soc., vol. xlii., 1859, pp. 289–308.

<sup>4</sup> Am. Journ. Med. Sci., Jan. 1862, pp. 54–60.